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| VLAHOS, SOPHIA | | | | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/801,930

Applicant(s)

CATREUX ET AL.

Examiner

SOPHIA VLAHOS

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-9, 11-13, 19-21, 23-35, 37-39, 41, 42 and 44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-9, 11-13, 19-21, 23-35, 37-39, 41, 42 and 44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 June 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 2/17/09 have been fully considered but they are not persuasive.

Applicant argues: (page 9 of "Remarks" section)

"Thus, while Foschini indicates that Foschini teaches that demultiplexing, weighting and combining before upconverting is the best method, Kohno disagrees. Instead, Kohno teaches that weighting and combining after upconverting is the best method.

Neither contemplates using weighting and combining both **before** and **after** upconverting."

Examiner Response:

The reference to Foschini et al. discloses weighting and combining **prior** to upconverting (in the transmitter of Fig. 1 for example). The reference to Kohno et al. discloses: weighting and combining **after** upconverting (weighting and combining performed in the transmitter of Fig. 4, where signals S1 and S2 are upconverted signals, column 8-12).

The reference to Foschini is used as the primary reference in the 35 103(a) rejection of claims 7, 19, 33, and 37. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

The differences between Foschini and claim 1 have been ascertained on page 3 of the Office Action.

"Foschini et al. do not expressly teach: dividing said first plurality of upconverted signals into a second plurality of divided signals; weighting said second plurality of divided signals so as to form a second plurality of weighted signals; combining ones of said second plurality of weighted signals in order to form a third plurality of combined signals and transmitting said third plurality of combined signals."

The Kohno reference is pertinent prior art (transmitter system using a plurality of transmitting antennas, Kohno column 3, lines 49-51, and Foschini column 1, lines 15-25) and discloses: dividing a first plurality of upconverted signals into a second plurality of divided signals; weighting said second plurality of divided signals so as to form a second plurality of weighted signals; combining ones of said second plurality of weighted signals in order to form a third plurality of combined signals and transmitting said third plurality of combined signals." (the S1 and S2 signals correspond to a first plurality of upconverted signals, which are divided and weighted and then combined see transmitter of Fig. 4, where signals S1 and S2 are upconverted signals, column 8-12).

It is the combined references (Foschini as modified by Kohno) that disclose all of the limitations of claim 1.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections

are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant argues: (page 10 of "Remarks" section)

"However, it is respectfully submitted that, in the context of Foschini, it would not have been obvious to modify Foschini using the teachings of Kohno.

The statement in Kohno at col. 6, lines 46-49 that "the error rates of the decoded signals can be reduced and the reliability of the communication system improved by maximum likelihood estimation" relates to a beam control circuit 130 that allegedly performs weighting and combining *after* upconverting.

There is no documentary evidence provided in the Office Action to support the allegation that the above-reproduced statement in Kohno at col. 6, lines 46-49, which is applicable to a beam control circuit 130 that allegedly performs weighting and combining *after* upconverting, would be applicable to an antenna signal developer 103 in Foschini that allegedly performs weighting and combining *before* upconverting.

In addition, since Kohno, *by itself*, allegedly already provides that its configuration (i.e., allegedly weighting and combining *after* upconverting) provides that "the error rates of the decoded signals can be reduced and the reliability of the communication system improved by maximum likelihood estimation" (Kohno at col. 6, lines 46-49), then why would one of ordinary skill in the art use the configuration in Foschini?

If Kohno, *by itself*, already provides the advantages outlined in the Office Action at page 4, then why does one of ordinary skill in the art need Foschini?"

Examiner Response:

The reference to Foschini is used as the primary reference in the 35 103(a) rejection of claims 7, 19, 33, and 37. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

As explained above, the differences between Foschini and claim 1 has been ascertained on page 3 of the Office Action. The Kohno reference is pertinent prior art (transmitter system using a plurality of transmitting antennas, Kohno column 3, lines 49-51, and Foschini column 1, lines 15-25).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Addressing the prior art, Kohno et al column 1, lines 30-45, explains "Further, the correlation of the transmission signals due to the interference among beams has not been utilized actively to improve communication efficiency and to improve the quality of communication. Thus, in the case of transmitting and receiving signals by forming a plurality of beams, that is co-called space diversity, the interference among beams has almost always been suppressed as much as possible to suppress interference and the correlation of transmission signals has not been utilized effectively."

The space-time transmit diversity system of Foschini is prior art for Kohno et al., and as explained in the cited passage, and in the space-time processing system of Foschini, correlation (interference) among beams has almost always been suppressed as much as possible and the correlation of transmission signals has not been utilized effectively.

Fig. 10 of Kohno et al. plots the BER vs. SNR of the prior art transmit diversity and the communication method of the present invention, (column 9, lines 56-61, column 10, lines 14-25). Examiner contends it would have been obvious to modify Foschini based on the teachings of Kohno et al. to effectively use correlation of transmission signals to obtain an improvement of the BER vs. SNR performance (or improve the reliability of the communication system, Kohno et al. column 6, lines 46-49).

Furthermore, according to the MPEP § 2141

"The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in KSR noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Court quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), stated that "[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" KSR, 550 U.S. at ___, 82 USPQ2d at 1396. Exemplary rationales that may support a conclusion of obviousness include:

- (A) Combining prior art elements according to known methods to yield predictable results;
- (B) Simple substitution of one known element for another to obtain predictable results;
- (C) Use of known technique to improve similar devices (methods, or products) in the same way;
- (D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- (E) " Obvious to try " – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
- (G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

Applicant argues: (pages 10-11 of "Remarks" section).

"It is respectfully submitted that Foschini and Kohno were improperly combined since they teach away from each other. See, e.g., M.P.E.P. § 2145(X)(D)(2)("[i]t is improper to combine references where the references teach away from their combination.")

Ultimately, such a change in Foschini (i.e., Kohno's modification to generate correlated beams to provide beam forming) would change Foschini's principle of operation which is to maximize the improvements of MIMO by having signals that are largely uncorrelated.

It is respectfully submitted that such a proposed modification in Foschini is prohibited by M.P.E.P. § 2143.01(VI)("[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the preferences are not sufficient to render the claims *prima facie* obvious.") (italics in original)."

Examiner Response:

Examiner disagrees that Foschini and Kohno were improperly combined since they teach away from each other. Applicant has cited lines 19-24 of column 1 of Foschini, where a preferred conditions for a MIMO system to achieve dramatically improved capacity are disclosed: "...rich scattering environments, so that the various signals reaching the multiple antennas be largely uncorrelated"

Foschini column 1, lines 25-30 in the "summary of invention section" explains: "We have invented a way of developing signals in a MIMO system such that even in the face of some correlation so as to obtain the most performance and capacity that can be achieved with a channel of that level of correlation." In other words, some correlation between the transmit beams of Foschini already exists, and Kohno et al. teaches using correlation between transmit beams to improve communication reliability (Fig. 10 column 9, lines 57-61, column 10, lines 14-25) and column 6, lines 45-51).

Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In re Susi, 440 F.2d 442, 169 USPQ 423 (CCPA 1971). "A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." In re Gurley, 27 F.3d 551, 554, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994).

For at least the above reasons, the rejection of claims 7-9, 11, 13, 19-21, 23, 44, 33-35, 41, 37-39 under 35 U.S.C. 103(a) as being unpatentable over Foschini et. al., (U.S. 6,888,809) in view of Kohno et al. (U.S. 7,110,468) is maintained.

Claim Objections

2. Claim 7 is objected to because of the following informalities: Claim 7, line 4, recites "signals prior to said upconverting;" the "said" is un-necessary since "said" refers to a previous upconverting step, whereas in the claim the upconverting takes place prior to upconverting.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 7-9, 11, 13, 19-21, 23, 44, 33-35, 41, 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Foschini et. al., (U.S. 6,888,809) in view of Kohno et al. (U.S. 7,110,468).

With respect to claims 7-9, 13 Foschini et al., disclose: demultiplexing an input signal into a first plurality of demultiplexed signals (Fig. 1, see demux 101 outputs,

column 3, lines 35-39); weighting and combining in the baseband domain, said first plurality of demultiplexed signals prior to said upconverting (Fig. 1, see weights out of weight supplier 105, supplied to block 103-1, and see adder 111-1 combining said weighted first plurality of demultiplexed signals, in the baseband domain (since upconversion takes place in blocks 117-n in a subsequent stage), column 3, lines 54-59, 66-67, column 4, lines 1-4); upconverting said first plurality of demultiplexed signals into a first plurality of upconverted signals (Fig. 1, see blocks 117-n that generate a plurality of upconverted signals from the first plurality of demultiplexed signals, column 4, lines 12-16).

Foschini et al. do not expressly teach: dividing said first plurality of upconverted signals into a second plurality of divided signals; weighting said second plurality of divided signals so as to form a second plurality of weighted signals; combining ones of said second plurality of weighted signals in order to form a third plurality of combined signals and transmitting said third plurality of combined signals.

In the same field of endeavor (transmission systems using multiple antennas), Kohno et al. disclose: dividing a plurality of upconverted signals into a plurality of divided signals (Fig. 4, details of block 130 of Fig. 2, signals S1 and S2 are each (split) divided into a plurality of n signals, and S1 and S2 correspond to up-converted signals see column 4, lines 41-43, 47-49 (modulation to carrier frequency of encoded data streams corresponds to upconverting to carrier frequencies); weighting said plurality of divided signals so as to form a plurality of weighted signals (Fig. 4, see weighting performed by weight $w_1(1)...w_1(n)$ and $w_2(1)...w_2(n)$ on the plurality of divided signals,

column 5, lines 18-31); combining ones of said plurality of weighted signals in order to form a plurality of combined signals (Fig. 4, function of adders 133-1...133-n, column 5, lines 32-45)) and transmitting said plurality of combined signal (Fig. 4, n antennas in block 140, column 5, lines 47-50).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system of Foschini et al. based on the teachings of Kohno et al. so that error rates of decoded signals are reduced and reliability of the communications system is improved (Kohno et al., column 6, lines 41-49, column 1, lines 30-43, Fig. 10 plot, and column 9, lines 57-61, column 10, lines 14-25).

With respect to claim 11, the system obtained by modifying Foschini et al. based on the teachings of Kohno et al. includes: wherein said second plurality of divided signals are RF signals and wherein said weighting and combining are performed within the RF domain (see the up-converted signals 117-1...117-n of Foschini et al. are split and weighted and combined as described by Kohno (the beamforming of Fig. 4 is also performed in the RF signal domain)).

With respect to claim 12, Foschini et al. further teaches: wherein said plurality of demultiplexed signals are less than said third plurality of antennas (column 1, lines 35-38, column 3 lines 36-46, less (Y) demultiplexed signals are used compared to N antennas).

Apparatus claims 19-21, 23-24 are rejected based on a rationale similar to the one used to reject method claims 7-9, 11-12 above.

With respect to claim 44, the system obtained by modifying Foschini et al. based on the teachings of Kohno et al. further includes: wherein values of said weighting elements are selected to maximize an output signal-to-noise ratio of a receiver disposed to receive said third plurality of combined signals (see Kohno et al. column 6, lines 40-50, and column 9, lines 56-61, column 10, lines 14-25, where in addition to minimizing BER, SNR is increased (attempted to be maximized))

With respect to claim 33, Foschini et al. disclose: a demultiplexer disposed to demultiplex an input signal into a first plurality of demultiplexed signals (Fig. 1, function of block 101, demux); an arrangement capable of weighting and combining, in the baseband domain, said first plurality of demultiplexed signals prior to the upconverter (function of arrangement comprising blocks 103-1 through 103-N, and weight supplier, see weighting and combining performed by multipliers 113 and adders 111-1 ... 111-N); an upconverter operative to upconvert said first plurality of demultiplexed signals into a first plurality of RF signals (Fig.1, upconverter comprising up-converters 117-1 through 117-N).

Foschini et al. do not expressly teach: an RF processing network operative to perform weighting and combining operations in the RF domain upon said first plurality of

RF signals, thereby producing a second plurality of RF signals capable of being transmitted by an antenna structure.

In the same field of endeavor (transmission systems using multiple antennas), Kohno et al. disclose: an RF processing network operative to perform weighting and combining operations in the RF domain upon a first plurality of RF signals (Fig. 4, processing network between S1, S2 and block 140, and signals S1 and S2 correspond to up-converted signals see column 4, lines 41-43, 47-49 (modulation to carrier frequency of encoded data streams corresponds to upconverting to carrier frequencies), column 5, lines 18-50, description of weighting and combining functions) thereby producing a second plurality of RF signals capable of being transmitted by an antenna structure (Fig. 4, outputs of adders correspond to the second plurality of RF signals, that are transmitted by antennas in block 140).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the system of Foschini et al. based on the teachings of Kohno et al. so that error rates of decoded signals are reduced and reliability of the communications system is improved (Kohno et al., column 6, lines 41-49, column 1, lines 30-43, Fig. 10 plot, and column 9, lines 57-61, column 10, lines 14-25).

With respect to claim 34, the system of Foschini et al. as modified by Kohno et al. further includes: wherein said RF processing network includes an arrangement of dividing elements capable of dividing said first plurality of RF signals into a third plurality of divided RF signals (Fig. 4 of Kohno et al. where RF signals S1, S2 are each divided

by dividing elements (shown as splitting wires) into a third plurality of divided RF signals)).

With respect to claim 35, the system of Foschini et al. as modified by Kohno et al. further includes: an arrangement of weighting elements capable of weighting said third plurality of divided EF signals so as to form a third plurality of weighted RF signals (Fig. 4 multipliers 131-1...131-n, 132-1...132-n and corresponding supplied weights); a combiner arrangement for combining ones of said third plurality of weighted RF signals in order to form said second plurality of RF signals (Fig. 4 combiner arrangement comprises combiners 133-1...133-n, forming the second plurality of RF signals (the ones capable of being transmitted)).

Claim 41 is rejected based on a rationale similar to the one used to reject claim 44 above.

Claims 37-39, 42 are rejected based on a rationale similar to the one used to reject claims 33-35, 41 above.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SOPHIA VLAHOS whose telephone number is (571)272-5507. The examiner can normally be reached on MTWRF 8:30-17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SOPHIA VLAHOS/
Examiner, Art Unit 2611
4/9/2009

/David C. Payne/
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